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for fully 7 m. Their breadth is more difficult to estimate ; but at more than one point it is equal to the length named. The city, or rather that part of it which is enclosed within the walls, lies on the left bank of the river. The walls are about 30 ft. in height, and 10 or 12 in thickness. The palaces of the first and second kings are situated within the walls ; but most of the nobles reside without, and the temples adorn the suburbs as thickly as the city. A good view of the city and surrounding country, can only be obtained by ascending the spire of some lofty pagoda. The spectator then sees to great advantage a very striking picture, prominent in which appear the roofs of the numerous temples, which are covered with coloured tiles, and profusely gilded. Then we have the tall spires of numerous pagodas, shooting up to the height of 150 and 200 ft. ; the palaces of the two kings and of numerous nobles, fantastically ornamented, and the scarcely less picturesque houses of the people, sheltered, enlivened, and frequently hid from view by bright green foliage, principally that of fruit-trees, which are thickly interspersed in every direction. The Menam, winding through the centre of this scene, adds greatly to its beauty and its animation. Boats of all sizes are constantly flitting to and fro upon its surface, and the whole commerce of the place is transacted in the floating houses, which, moored in tiers along its banks, and extending for some distance into the stream, give to Bangkok the appearance of a city on the waters.

VIII.—*Explorations into the Interior of Africa.* By Dr. DAVID LIVINGSTON, LL.D., etc. (*Gold Medallist.*)

(Continued from Vol. XXV.)

Communicated by Sir R. I. MURCHISON.

Read, March 10, 1856.

1. *Dr. Livingston's Astronomical Observations for Geographical Positions on his journey from the Leeba to Angola, and in Angola on his return : between January 1, 1854, and January 11, 1855 : with calculation of the Longitudes and Latitudes therefrom, effected at the Royal Observatory, Cape of Good Hope, by T. MACLEAR, H.M. Astronomer at the Cape of Good Hope.*

Royal Observatory, Cape of Good Hope,
29th Dec., 1855.

SIR,—The last letter I received from my friend Dr. Livingston is dated at Cassangé, Angola, January 29, 1855. He says, “I am now on my way back to the Zambesi, and thence I hope to descend to Quilimane on the east coast. It is rather a difficult task, for I

have none but Zambesians with me, and I suspect they will not be very willing to go so far from home and return again without my company. . . . I hope by God's help to reach the east coast about the end of the year.* I did not get a single letter from any of my friends while in Angola; hence I am quite ignorant of my family and every private friend."

At the time this letter reached me, H.M.S. 'Frolic,' Captain Nolloth, was about to leave the Cape for an eastward cruise, under instructions from Commodore Trotter, Commander-in-Chief on the Cape station. By Captain Nolloth I forwarded a packet of information to be left at Quilimane for Livingston, if he should not be found there. The 'Frolic' returned two days ago, after a passage of seventeen days from Quilimane, and I am sorry to say, without Livingston and without any information respecting him: but when the difficulty of the enterprise is considered, and that the 'Frolic' left about the 10th of December, whereas Livingston (as above stated) expected to reach the place by the *end* of the year, you will perceive that there is no just cause, at present, for alarm respecting his safety.

The Commodore informs me that Captain Nolloth did everything in his power to impress upon the authorities the very strong interest the public take in Livingston's safety, and the success of his expedition, and that very shortly the 'Dart' will be sent off to Quilimane.

On the other hand, Mr. Moffat, Livingston's brother-in-law, is of opinion, that on reaching Sesheké, where he will find a packet of letters, he will decide to come back to Kuruman, and put off the descent of the Zambesi for the present. In either case we may expect to hear of him by the end of February or the beginning of March.

In his last letter Livingston says, "I have requested Sir R. I. Murchison to consider all my positions as '*sub judice*' till you have examined them."

Accordingly herewith I transmit the original observations and the results deduced from them.

The results and special remarks occupy pages 1-6: the original observations and abstract of the calculations, pages 8-35. The latter is in fact a transcript of the "working sheets."

You will perceive by the explanations and remarks, that no pains have been spared in these reductions:—Almost in every case the observed altitudes were compared with altitudes calculated from the times, and thus several errors (most likely errors com-

* News of Dr. Livingston's arrival at Teté, February 15, has since reached England, and also of his subsequent arrival at the Mauritius, August 17.—ED.

mitted in copying) were detected. Probability too has been freely, but not unfairly drawn upon where needed. It is almost impossible to escape errors of entry and of calculation in a fixed observatory; then can we expect more from an harassed explorer in the bush threading his way through unhealthy swamps, and who has been nine times prostrated by jungle fever? It is astonishing that he has been able to accomplish so much for sound geography under the circumstances. Few, very few, explorers have so perseveringly and so geometrically fixed their tracks.

It may not be amiss here to remark, that when longitudes on land are determined by lunar distances, the altitudes for clearing the distance from the effect of parallax and refraction should be omitted, and the labour handed over to repeated measures of distance between the moon and stars or planets *both east and west* of the moon. Thus errors of contact and errors from spurious disc are eliminated by taking the mean, of the means east and of the means west. A practised computer can compute the altitudes for the before mentioned purpose in a few minutes.

The altitudes for time also, when practicable, as in the night, should be of an object east and an object west of the meridian.

I am, Sir, with great respect,

Your obedient humble servant,

T. MACLEAR,

H.M. Astronomer at the Cape of Good Hope.

To Sir Roderick I. Murchison.

2. *Corrections for the Quango, and the Chikapa.*

TO SIR RODERICK I. MURCHISON.

Cabango, Lunda Country, 17th May, 1855.

SIR,—Enclosed is a sketch intended to correct the map* of a part of the country through which I passed in excessively cloudy weather, and more especially to give the correct longitude of the Quango, a river of some interest and forming at present the Portuguese boundary eastwards. It is reported by intelligent natives to have its source by numerous streams in a ridge called Mosamba, 80 or 100 m. s.s.e. from our ford. And as that which we ascended gives rise to a very great number of rivulets, of from 5 to 20 yards broad and perennial, I have ventured to put the (yet ideal to me) source of the Quango on paper.

* These corrections were embodied in the Map accompanying Dr. Livingston's Papers in Journal, Vol. XXV.—ED.

I was unfortunate with the Chikapa ; the part at which we crossed ran w.n.w., and being subsequently misinformed as to its flow into the Quango, I put it down instead of that which I now find to be the Kukumbi. A portion of our route is put about a degree too far east.* The error arose from my being unable to obtain any observation for longitude in that part. I hope this may reach you before the map sent you from Cassangé is printed. I am a little ashamed at having made the mistakes, but after all the confession is only letting you know, that I am better informed now than I was before.

Although the country is exceedingly well watered there are no fountains. The rivers, although requiring canoes and containing hippopotami and alligators, seem all to ooze out of bogs. Indeed nearly all have margins of 100 or 200 yards of bog, which renders the passage extremely difficult. These must have considerable influence on the salubrity of the country.

I intend to turn southwards in a day or two, having obtained here at Cabango the chief object I had in view in desiring to visit Matiamvo, viz., information as to the Casai being a navigable river in his country. It is, I am sorry to find, obstructed by cataracts even westward of Mai and there is a large water fall near his town. But there is a large branch which enters the joined rivers (Quango and Casai) from the N.E. which contains a large body of water and "waves." It is named by the people of Mai the "Lobilash."

Hoping you will excuse the trouble I give,

I am, Sir,

Your most obedient servant,

DAVID LIVINGSTON.

[NOTE (to accompany the Map), as I am nearly blind at present from a blow on the eye by a branch in riding.—D. L.]

The Quango in lat. $9^{\circ} 48'$ s. and $9^{\circ} 52'$ s. winds in long. $18^{\circ} 25'$ E. and $18^{\circ} 30'$ E. It is reported to rise by numerous branches in the ridge, called Mosamba, which resembles that of Tala Mungongo.

Forded the Chikapa in lat. $10^{\circ} 10'$ s. and long. $19^{\circ} 42'$ E.

Forded the Maomba in lat. $9^{\circ} 38'$ s. and long. $20^{\circ} 13' 34''$ E. As the observations at Maomba were numerous and good, the long. of Cabango is reckoned thence, the moon being at present too near the sun.

Cabango, lat. $9^{\circ} 31'$ s., long. $20^{\circ} 31'$ or $32'$ E. It is a trading station and village of Muanzanza with 200 huts.

* Njambi placed on 19° and Panza on 20° , the route being prolonged in one case, in the other shortened.

Results of Dr. LIVINGSTON's Observations on his Journey from the Leeba to Angola.

(Continued from Vol. XXIV., pp. 301-306; Vol. XXV., p. 219.)

DATE.	STATIONS.		S. LAT.	E. LONG.
1854.			° ' "	° '
Jan. 1 ..	Kabombo's (near the Leeba) ..	I.	13 0 34	Not observed.
Feb. 1 ..	Village about 2' beyond ford (N.W.) of the Leeba, after leaving Kabombo's town. The hills Peerie or Piri bearing N.N.E., and about 6 distant	II.	12 6 6	22 57
Feb. 7 ..	Village of <i>Soana Molopo</i> , 3' from Lokaloye River	III.	11 49 22	22 42
Feb. 11 ..	Village of <i>Quendende</i> , about 2' S.E. of ford of the Lotembwa, and about 9' from town of Katema	IV.	11 41 17	*22 16
Feb. 17 ..	Katema's town: near the lake Dilolo, the source of the Lotembwa, and <i>that</i> one of the principal sources of the Leeba	V.	11 35 49	22 27
Feb. 28 ..	Village near the ford of river Casai, Kasye or Loké. The ford may be said to be in latitude 11° 17'. "This is a very important river: it flows into the country of Matiamvo"	11 15 55	Not observed.
March 8 ..	Banks of stream Chihuné ..	VI.	10 57 30	20 53
April 5 ..	Ford of the river Quango or Coanga	9 50 0
Ap. 13 & 17	Cassangé (about 40 or 50 miles w. of the river Quango or Coanga)	VII.	9 37 30	17 49
May 19 } Oct. 27 }	Golungo Alto	VIII.	9 8 30	14 51 } 15 9 }
Oct. 6 & 7	"Aquas doces" in Cazengo: "10 miles w. of Golungo Alto"	IX.	9 15 2	14 27
..	Confluence of Luinha and Luccalla	X.	9 26 23	Not observed.
Oct. 11 & 12	Massangano, town and fort ..	XI.	9 37 46	Not observed.
Dec. 6 ..	Ambaca, residence of Commandant	XII.	9 16 35	14 48 ? more probably 15 23

* Quendende lies S.E. from Katema's town, which latter is in longitude 22° 27'. It is therefore probable that Quendende is in longitude 22° 31'.

Results of Dr. LIVINGSTON's Observations on his Journey from the Leeba to Angola—*continued.*

DATE.	STATIONS.		S. LAT.	E. LONG.
1854.			° ' "	° '
Dec. 11 ..	Pungo Andongo, on the river Coanza	XIII.	9 42 14	15 30
Dec. 22	On the river Coanga. 2' w. of Pungo Andongo	XIV.	9 47 2	Not observed.
1855.				
Jan. 2 ..	Candumba, 15 miles e. of Pungo Andongo, 300 yards n. of the Coanza	XV.	9 42 46	*15 16
Jan. 3 ..	Confluence of Lombe and Coanza, 8 or 10 miles eastward of Candumba. Station, house of Mr. Pires about $\frac{1}{2}$ mile n. of Confluence	XVI.	9 41 26	†15 18
Jan. 7 ..	Sanza, on river Quize	XVII.	9 37 46	16 59
Jan. 10 ..	Banks of the Quize or Cuije, near its source, 2' w. of the sudden descent, which forms the valley of the Cassange ..	XVIII.	9 42 37	17 25
Jan. 11 ..	Tala Mungongo, 2 miles e. of preceding station	XIX.	9 42 37	Not observed.

REMARKS.

v. Katema's town.—Dr. Livingston's date is Feb. 18, 19 hours, but the 17th is clearly the correct date as shown by the \odot s distance from the ζ . It was on the 18th civil reckoning.

vi. Banks of the stream Chihuné.—Two sets of lunars were observed here, but the original observations are not given in full detail. The calculated *watch* errors from the given data differ $3^m 43^s$, but as the resulting longitudes differ only $7'$, it is probable that the watch was altered between the times at which the distances were observed.

vii. Cassange.—5 sets of lunars were observed here. In the 1st set $10'$ have been deducted from the last three observed distances, and 5^m from the time at which the first altitude of the ζ was observed.

The ζ 's altitude is calculated for the fourth set, as there is, apparently, some error in the observed altitudes, or in transcribing the numbers.

viii. Golungo Alto.—The longitude on Oct. 27, is the mean of 2 sets of distances of Sun and Moon, giving results differing $9\frac{1}{3}'$ from each other; that on May 19 also from 2 sets of Sun and Moon, differing $1'$ from each other, the watch errors in both cases derived from observations of the sun. Dr. Livingston gives as the result of 7 sets of lunars observed and reduced by him = $14^{\circ} 59'$, but he has not sent the

* If the longitude of Pungo Andongo, viz. $15^{\circ} 30'$, is correct (which there appears no reason to doubt) and Candumba is $15'$ to the e. of that place, the longitude of the latter place will be $15^{\circ} 46'$ and not $15^{\circ} 16'$.—J. A.

† The junction of the Lombe with the Coanza is about $25'$ e., and not as above 12' w. of Pungo Andongo, and 8' or $10'$ e. of Candumba; the junction is therefore in longitude $15^{\circ} 56'$ and not as above in $15^{\circ} 18'$.—J. A.

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observations. He states that Golungo Alto is about midway between Ambaca and Loanda.

ix. *Aquas doces* at the confluence of the Luinha and Luce in Cazengo.—This station is not more than 10° west of Golungo Alto according to Dr. Livingston.

The resulting longitude is the mean of 2 sets of the observed distance between the Moon and Jupiter, differing 3' from each other, the time being deduced from the altitudes of Jupiter. The watch errors are accordant and no source of error can be traced.

x. Massangano.—The longitude not observed, but “a prominent hill in Cazengo called Tunga is about 6° s.s.w. of *Aquas doces*, and it bears n.e. by e. from the house of the Commandant at Massangano.”

xii. Ambaca, residence of the Commandant of the district.—The longitude from one set observed between the Moon and Aldebaran, and one set between the Moon and Jupiter: the results differing 4'. The time from two altitudes of the Moon and the watch errors accordant. This station is east of Golungo Alto (see above). The correct limb of the Moon has been observed, and no source of error can be traced in the observations.

xiii. Pungo Andongo.—4 sets of distances of the Moon from the Sun were observed here. The first three give accordant results for longitude, the last differs 10'; the time is also well determined from the altitudes of the Sun.

xv. Candumba.—The longitude from one set of measures of distance between the ζ and Aldebaran, and 2 sets between the ζ and Jupiter. The results differ 22'. The time derived from altitudes of the Moon: the greatest difference of watch errors = 6°.5.

xvi. Confluence of the Lombe and Coanza. The longitudes are derived from one set of distance ζ —Aldebaran, and one set ζ —Jupiter. The results differing only 1', and the watch errors 3°.3 from two altitudes of the Moon. Procyon was observed for time, but there appears to be some error in the observation or in transcribing it. This station is 8 or 10 miles east of Candumba, and both are to the east of Pungo Andongo (according to description), whereas the observations place them both to the west of it. In the case of Pungo Andongo, if we were to calculate on the assumption that the *upper* limb of the Sun had been observed, the longitude would become about 15°.0' which is in accordance with the other two positions; but this is inadmissible, as the watch error given by the Moon, whose upper limb must have been observed, agrees nearly with that deduced from the Sun.

At this station the Coanza takes its southern bend to s.e. or s.s.e.

xvii. Sanza.—Longitude from 4 sets of distances \odot — ζ and greatest difference of the results 15'. The watch errors are derived from observations of the Sun, and are accordant.

xviii. Banks of the Quize near its source, 2' west of the sudden descent which forms the valley of the Cassange. Longitude from one set of distances of \odot — ζ . The time from the altitudes of the ζ . The watch errors differ 3°.2.

IX.—*Visit to Moselekatse, King of the Matebele.* By the Rev. R. MOFFAT.

Communicated by the LONDON MISSIONARY SOCIETY.

[THE health of our honoured Missionary Brother having suffered considerably from his unremitting labours on the Sechuana Scriptures, he undertook an extended journey into the interior, partly for relaxation, but chiefly with a view to renew his acquaintance with the barbarian king of the Matebele, and to obtain his aid in forwarding supplies to Dr. Livingston, then absent on his fourth exploratory tour.

We have just received Mr. Moffat's long-expected journal, comprising the